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ABSTRACT

The concurrent validity of the Boehm Test of Basic Concepts (BTBC) was investigated by comparing it to two tests of linguistic abilities (Test of Auditory Comprehension of Language--TACL--and the Carrow Elicited Language Inventory--CELI) and five Piagetian tests of cognitive abilities (space, numeration, seriation, time, and classification) with 60 kindergarten children. The strongest correlation of the BTBC was with the test of receptive language (TACL). Correlations with the Piagetian tasks were moderate but significant, and were interpreted to mean that the BTBC can be used as a general estimate of cognitive ability. Canonical analysis of all variables revealed the presence of one common factor, language comprehension. Predictive validity was established using the Metropolitan Readiness Test which was given 8 months later. End of the year placement decisions revealed that low scores on the BTBC correctly identified four of five students who were recommended for placement in special education classrooms. (Author/CL)

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CONCURRENT AND PREDICTIVE VALIDITY OF THE BOEHM TEST OF BASIC CONCEPTS

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Running Head. Boehm Test of Basic Concepts

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CONCURRENT AND PREDICTIVE VALIDITY OF THE BOEHM TEST OF BASIC CONCEPTS

Formal assessment has become an integral part of the education of exceptional young children. Many new tests are available which help the teacher identify pupils with potential learning problems. These tests also identify specific strengths and weaknesses of the children.

The Boehm Test of Basic Concepts (BTBC) (Boehm, 1971) was developed as a group test to be used in kindergarten and first grade. The BTBC consists of 50 items designed to measure the child's understanding of space, time, quantity and other concepts encountered in primary curriculum materials. The items are arranged in order of increasing difficulty. Children mark a picture which corresponds to verbal directions given by the examiner. Concepts such as "middle, "alike", and "separated" are included on the test.

The BTBC has been used as a criterion-referenced test by which conceptual strengths and weaknesses for children could be identified (Boulder VAlley School District, R-2, 1975; Clyne, 1973; Darnell, 1976). This was the primary use suggested by its author (Boehm, 1971). However, it has also been used as a general measure of cognitive development (Cincinnati Public Schools, 1973; Howell, 1975; Jones, Traitt, Washington, & Silcott, 1975; Lindstrom and Tannebaum, 1970; Paterson Board of Education, 1971).

The BTBC has yet to be validated as a test to measure conceptual knowledge or cognitive development. A test is said to be validated if it measures what the authors or users claim. Several types of validation may be used for tests. One of these, construct validity, examines the theoretical or underlying framework of the test. This is usually done by correlation of the results of the test with the findings on other tests designed to measure similar or related knowledge or abilities. When tests are administered within a short time of each other, concurrent validity is established.

In this study the concurrent validity of the BTBC was investigated. Analysis of the results enabled the underlying constructs of the test to be examined. The working hypothesis was that the knowledge of the concepts included on the BTBC involved linguistic and cognitive abilities. Boehm said that the items on the BTBC were selected as a sample of conceptual knowledge used in schools and therefore were needed by children (1971). However, in order to do well on the test, the child must first understand the verbal messages of the examiner. The child then matches his/her understanding of the verbal message with the appropriate picture in the test booklet. Both linguistic and cognitive abilities are involved.

Boehm claims that "Validity is primarily a matter of the relevance of test content to school curriculum" (1971, p.29). Only content validity is presented in the

BTBC manual. Content validity is "established by examining ... the appropriateness of the types of items included, the completeness of the item sample, and the way in which the items assess the content" (Salvia & Ysseldyke, 1978, p. 96). Boehm initially selected test items on the BTBC by reviewing primary grade curriculum materials. Concepts frequently used but not explained were included on the test. Boehm did not specify which curriculum materials were reviewed. This claim of content validity cannot be considered as sufficient justification for use of the test. Some critical reviews have supported Boehm's claim of validity (e.g. McCandless; Smock, in Buros, 1975). Other reviewers have, however, questioned these validity statements. They have proposed the need for construct and criterion-related validity investigations (Lawlor; Freeman; Proger, in Buros, 1975).

Only one study presented evidence of concurrent validity for the BTBC. An abbreviated form of the test was individually administered to preschool disadvantaged children. Correlations with the Peabody Picture Vocabulary Test (Dunn, 1959) were computed. The Pearson Product-moment correlation (r = .62) was interpreted to support the proposition that the BTBC is a test of verbal ability. A lower correlation (r = .41) with the California Preschool Social Competency Scale (Levine, Elsey, & Lewis, 1969) was interpreted to reflect common attentional and intellectual components of both tests (Levin, G.B., Henderson, B., Levin, A.M,, & Hoffer, G.L., 1975).

The predictive validity of the BTBC for first grade achievement has also been investigated. Busch (1974) used the BTBC in combination with a number of instruments to predict reading achievement. The BTBC was not significantly better than the other measures in this prediction. Estes and others (1976) have found a positive relation (r=.56) between the BTBC administered in September and the Stanford Achievement Test, Primary I Battery administered in May.

The BTBC may be used more appropriately as a predictor of kindergarten achievement. The concepts may be more indicative of a general school readiness factor than specific skills needed in academic subjects. If so, the use of the BTBC as a screening instrument to detect young children with potential learning disorders would be supported. Performance on a readiness test is a useful measure of kindergarten achievement. A second, more general indication of kindergarten achievement, is the end-of-year placement decision for the child. Placement in a regular first grade class would probably indicate a reasonable potential for success. Placement in a special education class or retention in the kindergarten would probably indicate some type of learning disorder.

METHOD

Concurrent validity was investigated by comparing the BTBC with two linguistic tests (Test of Auditory Comprehension of Language, Carrow, 1973, and Carrow Elicited Language Inventory, Carrow, 1974a) and five cognitive tasks (Space, Numeration, Seriation, Time, and Classification). The Metropolitan Readiness Test (Hildreth, Griffiths, & McGauvran, 1965) and end-of-year placement were used to establish predictive validity.

SUBJECTS

The group of subjects consisted of 144 children in kindergarten classes from a single school district in northeastern Ohio. Subjects who were repeating kindergarten were excluded from the sample. The ages of the subjects ranged from 5;1 to 6;0 years and their mean age was 5;6 years.

TESTS

Boehm Test of Basic Concepts (BTBC)

The BTBC has been described in the introduction. Four categories of items defined by Boehm include Space, Quantity, Time and Miscellaneous. For this study, the investigator divided the Quantity category into Seriation and Number subcategories to facilitate more precise matches to cognitive tests.

Data provided in the manual for Form A shows that this is a reliable test at the kindergarten level. The split-half reliability coefficient is .90. The standard error of measurement is 2.9.

Test for Auditory Comprehension of Language (TACL)

The TACL was used to measure the subjects' receptive language ability. This test consists of 101 pictorial stimuli which are matched to the examiner's verbal stimuli. The test is administered individually with the child responding by pointing to one of the three-choice alternatives.

The TACL has been validated for developmental trends in scores (Carrow, 1971; 1972; Jones, 1972, cited in Carrow, 1973). Other studies have shown that the TACL can discriminate language disordered children from those who are not language disordered (Carrow & Lynch, 1973, cited in Carrow, 1973; Bartel, Bryan, & Keehn, 1973).

Carrow Elicited Language Inventory (CELI)

This is a test of expressive language ability. Basic sentence types and specific morphemes are elicited from the child using an imitation technique. The total raw score represents the number of errors. The test is administered individually. The subject's oral response is recorded on audio equipment and transcribed.

Concurrent validity was established for the CELI. When it was correlated to another measure of expressive language, Developmental Sentence Scoring (Lee, 1974), a strong relationship was found ($r=-.79$). The correlation was negative because the tests used opposite scoring criteria (Carrow, 1974b).

Cognitive Tests

The developmental theory of Piaget describes a sequence of cognitive structures which directly relate to the concepts measured on the BTBC. The tests of cognitive abilities were chosen to conform to this theory. Five substantive areas were measured involving the child's conception of space, time, numeration, seriation, and classification. These were aligned respectively to the BTBC categories of Space, Time, Quantity (Number and Seriation subcategories) and Miscellaneous.

Space The Localization of Topographical Position (Laurendeau & Pinard, 1970) was chosen to evaluate the child's conception of space. Subjects were asked to mimic the positioning of a doll on a landscape board. Initially the examiner's board was placed in the same orientation as the subject's board. Subsequently, the examiner's board was rotated 180°. Subjects at the preoperational stage of development placed the doll with less than 75% accuracy in both the standard and rotated positions. Subjects performing at the concrete operations level were able to correctly place the doll on the landscape board with more than 75% accuracy in both board positions (standard and rotated).

Time The test was adapted from the "walking doll" task, The Succession of Perceptible Events (Piaget, 1969). The first part of this test involved the subject and examiner walking across the room. The subject was required to identify who started first and who traveled for a greater distance and for a longer time. The subject also manipulated toy cars on a road. Imitation behavior was used to provide a nonverbal response. Verbal responses were obtained by questioning.

At the preoperational stage, the subjects could not accurately decide whether both individuals or cars were starting or stopping at the same time. They also could not determine if both individuals or cars had been moving for unequal periods of time, even when the temporal and spatial dimensions were harmonious. At the concrete operations stage, subjects correctly indicated that the cars were traveling at different speeds but for the same distance (i.e., when spatial and temporal dimensions were apparently discordant).

Classification This test included a free sort and a forced dichotomy of a set of geometric figures. The test was designed by Kamii (1971). Subjects were asked to separate a set of geometric shapes which varied in size, shape, and color on two dimensions. The preoperational stage was marked by the inability of the subjects to sort by any attribute and a reliance on graphic properties in the free sort. At the concrete operations stage subjects could sort the same group of figures using three different sets of attributes.

In the Miscellaneous category of the BTBC such terms as "some" and "different" were used. These terms represented concepts needed in the classification test.

Number The conservation of number test (Kamii, 1971) included a demonstration of provoked 1-1 correspondence. Comprehension of the relationship of spatial (linear) arrangement to quantity judgments was also evaluated.

The preoperational stage was characterized by a lack of understanding of the relationship of quantity to spatial arrangement. There was no evidence of 1-1 correspondence. The concrete operations stage was observed in subjects who could explain the phenomenon that spatial arrangement did not affect quantity.

Seriation In this test subjects first had to order a set of ten dolls (½ inch discrepancy). Subjects then had to coordinate a set of ten sticks (½ inch discrepancy) with the dolls (Kamii, 1971).

Subjects at the preoperational stage could only seriate 5 dolls (1 inch discrepancy) whereas subjects at the concrete operations stage could systematically seriate 10 dolls and 10 sticks and coordinate them properly.

Metropolitan Readiness Test (MRT)

This test was used to represent academic achievement at the kindergarten level. The MRT contains items which measure vocabulary, alphabet recognition, numbers and copying skills. It has been standardized on a large population which appears to be representative of the nation of the whole. The reliability of the total score is reported to be r= .90. A correlation with the Murphy-Durrell Reading Readiness Analysis, Revised Edition, is reported for the standardization sample at r=.80. The Pintner-Cunningham Primary Mental Ability Test is highly correlated with the total MRT (r=.76).

Predictive validity has been found for the MRT with correlations with reading tests ranging from r=.62 to .67 and with math tests (r=.64).

End-of-Year Placement

Teacher reports of end-of-year placement decisions were collected. The subjects were separated into five groups: 1) promoted, 2) retained, 3) placed in educable mentally retarded class, 4) placed in learning disabilities class, and 5) other. This measure was included as a gross indication of school success and to provide another substantive basis on which to assess predictive validity of the BTBC.

PROCEDURE

All tests used in the study of concurrent validity (BTBC, TACL, CELI, Piagetian tests) were administered in a 2 month period in the Fall. The test used in the study of predictive validity (MRT) was given in the Spring, 8 months later.

The BTBC was given first to all pupils (n = 144). Small groups (n = 8) were tested following the procedures recommended in the manual (Boehm, 1971). Only Form A was used to allow maximum comparability of performance. Ideally, the entire sample would also have received all tests used in this study. However, because of the length of time required for the individual testing, a small sample was selected. A stratified random sampling technique was used to insure homogeneous variability within the smaller group. A group of 15 subjects was randomly chosen from each quartile range of performance on the BTBC. All linguistic and cognitive tests were then given to 60 subjects.

The order of presentation of tests was varied so that possible transfer effects were minimized. The measures of linguistic ability were administered in one setting of 20 minutes. The cognitive tests were administered in another setting of 30 minutes.

In the Spring, the Metropolitan Readiness Test was given to the small sample. End-of-year placement data was also collected at this time. Because 5 subjects had moved during the academic year, data was only collected for 55 subjects.

RESULTS

The analysis of the BTBC for internal consistency using Pearson product-moment correlations yielded moderate to high positive correlations ($p < .001$) (See Table 1). Correlations ranging from $r = .73$ to .92 were found for each of the subtest with the total score. Correlations among the subtests were slightly lower, ranging from $r = .49$.

Insert Table 1 about here

Pearson product-moment correlations were used to evaluate the relationship between performances on the linguistic test and the BTBC. Moderate to high positive correlations were found with the TACL and reported in Table 1. Two clusters were evident. The BTBC Total and Space subtest correlations with the TACL were the strongest. The remains subtest correlations were weaker. However, all correlations were statistically ($p < .01$).

Moderate positive correlations were found between the BTBC Total score and all five cognitive tests. Subtest correlations were lower. The expected match to BTBC subtest and Piagetian test of the same substantive area was supported by the presence of the highest correlations for Seriation and Time. Space, Number and Miscellaneous (classification) areas had mixed results (See Table 1).

The nature of the intercorrelation among measures used in this study was analyzed with a canonical correlation. Predictor variables included subtests on the TACL, the CELI, and the five cognitive tests. The five subtests of the BTBC made up the second set of criterion variables. Only one of the five canonical correlations was significantly greater than chance. The canonical variate represented an optimal combination of the portions of variance in scores which can be accounted for by the variables.

This canonical variate indicated that there is one general point of commonality between the two sets of variables. The variate with 45 degrees of freedom was significant ($p < .001$). All variables with the exception of CELI, TACL Syntax, and Piaget Number, had structural coefficients greater than .500 (See Table 2).

Insert Table 2 about here

Pearson product-moment correlations were used to evaluate the correspondence of performance on the Metropolitan Readiness Test with the BTBC, A moderate positive correlation was found ($r = .51$, $P < .01$). In order to note the relative strength of this correlation, values were also computed for the other variables in this study. The correlation found for the BTBC was the highest. The TACL ranked second ($r = .47$) All remaining variables had lower correlations.

When these same variables were stepped into a prediction equation for the MRT using multiple regression analysis, the BTBC still proved to be able to account for the largest amount of variance on the MRT

($\underline{R}$ =.519; $\underline{R}^2$ = .269). No other variable added significantly to the prediction. When the BTBC, Space, Number, Time, Seriation, Classification TACL and CELI were stepped into the equation, the multiple correlation value was only increased to $\underline{R}$ = .624; $\underline{R}^2$ =.389.

Placement decisions were collected for the remaining sample. According to teacher report, 50 of the 55 subjects would be promoted to first grade. None were retained, nor placed in another setting. Three subjects were to be placed in a class for learning disabled students and two were placed in a class for educably mentally retarded students. Because of the small number of placement decisions different from promotion, direct observation of individual scores was used in the analysis of the findings.

When BTBC Total scores are viewed for each the the five students receiving special class placement, it can be noted that four of these subjects fell in the lowest quartile of performance. In fact a ranking of all subjects (n=60) in the stratified random sample would place these four subjects at the 46th, 55th, 56th, and 60th positions. The other subject receiving special class placement (Learning Disabilities) scored above the mean in the second quartile.

DISCUSSION

These findings support the hypothesis that there is an overlap of linguistic and cognitive factors in the Boehm Test of Basic Concepts. The strong correlations of the subtests with the total score of the BTBC indicate that it does not measure discrete abilities or knowledge. Language comprehension is an underlying factor in test performance. The child must interpret the structure and form of the syntax in the verbal stimuli provided by the examiner. At the same time the child

must differentiate that part of the message which represents the concept being tested. Its meaning must be interpreted cognitively to correctly identify the picture represented in the test booklet.

None of the tests used in this study involved purely linguistic or cognitive abilities. However, they were chosen because the presentation and/or response mode was judged to be primarily linguistic or cognitive. For example, cognitive tests included verbal directions and responses. Each cognitive test also contained a nonverbal demonstration of procedure as well as a nonverbal response. This combination of activities was considered more representative of cognitive than linguistic abilities. Tests which were primarily verbal (i.e., TACL & CELI) were considered to be more representative of linguistic abilities.

The high correlations found between the BTBC and TACL indicate that the BTBC measures linguistic ability. The lower correlations with the CELI indicate that the BTBC is a better measure of receptive language than expressive language. The child's imitative language abilities are not strongly related to performance on the BTBC.

The relationship between measures of cognitive development and the BTBC is not clearly defined by this study. The correlations are moderate. In general, Piagetian tests correlate higher with the total score on the BTBC than with the subtests. This finding is interpreted to mean that the BTBC functions as a general estimate

of cognitive abilities. It does not accurately measure discrete concpets or concept clusters. Piagetian tests discriminate better among the various substantive areas.

The findings in the canonical analysis can be used to support the proposed Language Comprehension factor. The strongest relationship was noted among those test which required predominantly linguistic abilities.

The significant correlation ($p < .01$) found for the Metropolitan Readiness Test and the Boehm Test of Basic Concepts supports the claim that knowledge of the concepts included on the BTBC is related to school achievement at the kindergarten level. The correlation is similar to the one found with the Stanford Achievement Test in a study conducted to predict reading achievement in first grade ($r = .56$) (Estes, Harris, Moers, & Wodrich, 1976).

The fact that the BTBC proved to be the best predictor for the MRT suggests that this test may be more closely related to the traditional measures of school achievement than either the language or cognitive test used in this study. The findings in this study, however, do suggest that the BTBC does represent the abilities required on those language and cognitive tests. It can be inferred that performance on the BTBC represents a portion of the cognitive and linguistic requirements of academic success.

The match for the end-of-year placement decisions reveals that four of the five students placed in special education settings also ranked in the lowest quartile of performance on the BTBC in the beginnning of the school year. This does not account for the remaining 8 (3 subjects had moved) who also placed in the lowest quartile on the BTBC in the fall, but were promoted in the spring.

False indentification may be avoided by using scores in the lowest 10th percentile. What it may suggest, is that the BTBC could be used as a screening instrument to detect potential school learning difficulties but should not be used as a sole selection criterion.

The BTBC has been shown by this study to be a valid test for use in early childhood education. It is most appropriately used as a general indication of the child's ability to comprehend verbal concepts. It could be used as a screening test to identify children in need of further testing. The testing procedure of the BTBC is convenient and efficient compared to lengthy individual testing required in cognitive and linguistic assessment.

In addition, the BTBC is a valuable source of information for children with language deficits. It measures comprehension abilities which are not strongly related to expressive abilities. It may be possible to translate the BTBC into sign language for use with hearing impaired students. It has already been translated into Spanish (Boehm, 1971) and Navajo (Rosenbluth, 1976).

References

Bartel, N.R. Bryan, D., & Keehn, S. Language comprehension in the moderately retarded child. Exceptional Children, 1973, 39, 375-381

Boehm, A.E. Boehm Test of Basic Concepts. New York: The Psychological Corporation, 1971.

Boulder Valley School District, R-2. A personalized kindergarten program with supplementary parent involvement. A final report. Boulder, Colorado, 1975. (Eric Document Reproduction Service, No. ED 116 791).

Buros, O.K. (Ed.) Intelligence tests and reviews. Highland Park, New Jersey: The Gryphon Press, 1975.

Busche, R.F. Predicting first grade reading achievement, Doctoral dissertation. University of Missouri, Columbia, 1974 Dissertation Abstracts International (University Microfilms, No. 75-15973).

Carrow, E. Comprehension of English and Spanish by preschool Mexican-American children. Modern Language Journal, 1971, 55, 299-306.

Carrow, E. Auditory comprehension of English by monolingual and bilingual preschool children. Journal of Speech and Hearing Research, 1972, 15, 407-412.

Corrow, E. Test for auditory comprehension of language. Austin, Texas: Learning Concepts, 1973.

Carrow, E. Carrow elicited language inventory. Austin, Texas: Learning Concepts, 1974 (a).

References

Carrow, E. A test using elicited imitations in assessing grammatical structure in children. Journal of Speech and Hearing Disorders, 1974, 39, 437-444 (b).

Cincinnati Public Schools. Impact of a preschool and interracial program. Project termination report. Cincinnati, Ohio, 1973. (ERIC Document Reproduction Service, No. ED 093 480)

Clyne, R. Emphasis: Indentification. Anchorage, Alaska: Anchorage Borough School District, 1973. (ERIC Document Reproduction Service No. ED 075 101)

Darnell, D. A parent-teacher joint assessment of the entereing and existing kindergarten child, 1972-1976. Paper presented at the annual meeting of the American Psychological Association, Washington, D.C., September 3-7, 1976. (ERIC Document Reproduction Service No. ED 129 446)

Dunn, L. Peabody picture vocabulary test. Minneapolis, Minnesota: American Guidance Service, 1959.

Estes, C.H. Harris, J. Moers, F & Wodrick D. Predictive validity of the Boehm test of basic cocnepts for achievement in first grade. Educational and Psychological Measurement, 1976, 36, 1031-1035.

Howell, J.F. A follow-up evaluation of a preschool program. Paper presented at the annual meeting of the New England Educational Research Organization, Provincetown, Massachusetts, May 1-3,1975. (ERIC Document Reproduction Service No. ED 115 669)

Jones, J., Taitt, A.L., Washington, K., & Silcott, T.G. Learning and self-esteem among black and white preschoolers. New York: Black Analysis, Inc., 1975. (ERIC Document Reproduction Service No. ED 122 926)

References

Kamii, C.K. Evaluation of learning in preschool education: Social-emotional, perceptual-motor, and cognitive development. In B.S. Bloom, J.J. Hastings, & G.F. Meadows (Eds.) Handbook on formative and summative evaluation of student learning. New York: McGraw Hill, 1971.

Hildreth, G.H., Griffiths M.A., & McGauvran, ME. Metropolitan Readiness Test, Form A; New York: Harcourt Brace and World, 1964.

Laurendeau, M. & Pinard, A. The development of the concept of space in the child. New York: International Universities Press, Inc., 1970.

Lee, L. Developmental sentence analysis. Evanston, Illinois: Northwestern University Press, 1974.

Levin, G.B., Henderson, B. Levin, A.M. & Hoffer, G.L. Measuring knowledge of basic concepts by disadvantaged preschoolers. Psychology in the Schools, 1975, 12, 132-139.

Levine, S., Elzey, F.F., & Lewis, M. California preschool social competency scale. Palo Alto, California: Consulting Psychologist Press, 1969.

Lindstrom, D., & Tannebaum, J. Concept and language development of a group of five-year-olds who have attended the Syracuse University children's center intervention program. Syracuse, New York: Syracuse Univeristy, 1970. (ERIC Document Reproduction Service No. ED 046 515)

Murphy, Darnell, D. Murphy-Darnell Reading Readiness Analysis. Revised Edition, New York, Harcourt Brace and World.

Paterson Board of Education, Dale avenue school early childhood education center project. Research Bulletin, Vol. 1 (4) 1970-1971. (ERIC Document Reproduction Service No. ED 089 498)

References

Piaget, J. The child's conception of time (A.J. Pomerans, trans.) New York: Basic Books, Inc., 1969 (First published in France, 1927).

Rosenbluth, A.R. The feasibility of test translation between unrelated languages: English to Navajo. TESOL Quarterly, 1976, 10, 33-44.

Salvia, J., & Ysseldyke, J.E. Assessment in special and remedial education. Boston: Houghton Mifflin Company, 1978.

Pintner, R. Cunningham B.R., & Durast, W.N. Pintner-Cunningham Primary Mental Ability Test, New York: Harcourt Brace Jovanovich, 1964.

Table 1

Pearson product-moment correlations
between BTBC , linguistic, and cognitive tests

	BTBC					
	Total	Space	Number	Seriation	Time	Miscellaneous
Linguistic tests						
TACL	.745***	.735***	.594***	.528***	.552***	.532***
CELI	-.338*	-.257	-.376**	-.183	-.233	-.410**
Cognitive tests						
Space	,464**	.503**	.350**	.246	.366**	.313*
Number	.358**	.294*	.280*	.317*	.202	.392**
Seriation	.463**	.403**	.320*	.449**	.419**	.320*
Time	.604***	.602***	.453**	.432**	.443**	.458**
Classification	.554***	.516***	.497***	.400**	.432**	.396**
BTBC						
Space	.921***					
Number	.832***	.699***				
Seriation	.732***	.529***	.531***			
Time	.774***	.636***	.626***	.494***		
Miscellaneous	.771***	.624***	.572***	.505***	.602***	

*** $p < .001$

** $p < .01$

* $p < .05$

n = 59, d.f. = 57

Table 2

Weightings and structural coefficients

for each variable on canonical variate one

$\underline{R}$= .861 $\underline{R^2}$ = .741

Variable	Weighting	Structural Coefficient
Predictor Set		
1 TACL Vocabulary	.149	.713
2 TACL Morphology	.516	.856
3 TACL Syntax	-.029	.420
4 CELI	.061	-.345
5 Piaget Space	,102	.561
6 Piaget Number	.072	.392
7 Piaget Seriation	-.030	.530
8 Piaget Time	.324	.714
9 Piaget Classification	.288	.638
Criterion Set		
10 BTBC Space	.697	.969
11 BTBC Number	.112	.798
12 BTBC Seriation	.210	.707
13 BTBC Time	.069	.732
14 BTBC Miscellaneous	.052	.707

(n=59)